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NOTES ON CLIMATOLOGY.

BY

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THE CLIMATE OF THE HIGH PLAINS.—A recent report of considerable meteorological interest is likely to escape the notice of meteorologists because of its publication in the Annual Report of the United States Geological Survey. This is a monograph on *The High Plains and their Utilization*, by Willard D. Johnson (21st Annual Report, U. S. Geol. Survey, Pt. IV, Hydrography, pp. 609–768). The High Plains correspond to what is sometimes called, for convenience, the Central Plains region. They lie in an irregular belt about midway across the long eastward slope of the Great Plains. The High Plains have practically no drainage, the local precipitation being disposed of by absorption. They are virtually unscored by erosion. Climatically, they lie in the Subhumid Belt. These High Plains were in the '80's the scene of an interesting but pathetic struggle on the part of man to occupy the land for agricultural purposes. Because of insufficient rainfall, failure followed these attempts, and the region was almost completely depopulated. Yet in spite of these discouraging pages in the recent history of the region, the High Plains are still an alluring body of unoccupied land, and will remain so until the best means for utilizing them have been devised. These lands are flat and fertile, and their annual rainfall at intervals is sufficiently heavy to make agriculture a paying investment of time and money. If farming is to be permanently profitable, however, experience has clearly shown that irrigation must be resorted to; and it is the purpose of Mr. Johnson's paper to show that, except to an insignificant extent, the High Plains cannot be irrigated so as to be reclaimable for general agricultural purposes, either from streams or from underground sources. Water is, however, obtainable from under ground in sufficient quantity to enable the entire area to be reclaimed for other uses than agricultural. This reclamation has already been begun, and it will be universally profitable. The problem is one of well-making, and of the proper location of wells, and then, by means of windmills, these Plains can be reclaimed from their present unprofitable condition and be successfully utilized as cattle ranges. This is to be the future of the High Plains.

The chapter of greatest interest from a climatic standpoint is the third, which deals with the *Deficiencies of Climate.* In this the reader will find an excellent presentation of the climatic characteristics of this interesting region. The climatic deficiencies of the High Plains as compared with the northwest are thus summed up: (1) The summer rains on the plains are violent and of brief duration, as a rule, rather than gentle and long-continued, as they commonly are to the north; (2) secular variation from the normal precipitation works greater harm; (3) the normal summer temperature is notably greater; (4) the relative humidity is notably less; (5) there are more hours of sunshine; (6) there is more wind, which, during the summer, is prevailingly from the south, is warm, and, therefore, has a drying effect, whereas during the same season in the northwest the prevailing winds are northerly; and (7) it is found that, as an effect of the brief ponding rains, the high temperature, the low relative humidity, the almost uninterrupted sunshine, and the persistent high winds, evaporation is greater in a marked degree. This chapter contains the best discussion of the climate of the general region in which the High Plains lie that has been published. The report as a whole, while largely geological and geographical in character, is full of interest to the climatologist, emphasizing as it does the control exercised by the climatic conditions of the Plains over the settlement of the region and the occupations of its inhabitants. There ought to be many more studies of this sort along the lines of human climatology and of human geography.

FORESTS, SNOW, AND IRRIGATION.—Increasing attention is being paid to the study of the amount of water available for irrigation purposes in those parts of our country where the rainfall is deficient, as, for example, in the High Plains region just alluded to. In connection with these irrigation problems a question of the greatest importance is the amount of snowfall on the mountains of the semi-arid region, and of the conditions of melting of this snow. In a recent paper on *Forests and Snow* (Bull. 55, Colo. Agric. Exper. Sta.), Professor L. G. Carpenter gives the results of an investigation made by him in the mountains of Colorado in the summer of 1900. The mountain streams in the early irrigation season are largely supplied by melting snow, and there is a marked diurnal fluctuation, which results from the daily variation in the rate of melting, and which disappears when the weather in the mountains is cloudy. It is interesting to note that the decrease in flow during the cloudiness, associated with continued rain, is so great that it usually more than counterbalances the gain from the rain. A forest cover protects the snow, and the greater the amount of this cover the more uniform is the flow of the streams throughout the day and the season and the later the stream maintains its flow. Professor Carpenter concludes that the preservation of the forest is an absolute necessity for the interest of irrigated agriculture. The paper is illustrated by a number of half-tone plates, showing the forests with and without snow.

HANN'S LEHRBUCH DER METEOROLOGIE.—The newest text-book of meteorology, Hann's *Lehrbuch der Meteorologie* (Leipzig, Tauchnitz, 1901, p. 805), is one of the most important meteorological publications of recent years. Since Schmid's classical *Lehrbuch der Meteorologie* of 1860 there has been no attempt to bring out so comprehensive a book as that of Dr. Hann. The new *Lehrbuch* is a treatise rather than a text-book. It is an admirable compact summary of the present state of our knowledge of meteorological science. The references are copious, well selected, and given with great accuracy and completeness. As a bibliography alone the *Lehrbuch* is a valuable publication. The book will prove indispensable to every one who wishes the latest and best authority on meteorology, and it is a fitting companion volume to the same author's *Handbuch der Klimatologie*. It is a pleasure to know that an English translation of the new book is already under way; for this is a volume that should be generally used by English-speaking meteorologists and climatologists, as well as by those who are non-professionally interested in meteorology.

THE CAUSE OF GLACIAL PERIODS.—The question as to the cause or causes of glacial periods is old, but ever new. Before the British Association at Glasgow, Mr. H. N. Dickson read a paper on *The Mean Temperature of the Atmosphere and the Causes of Glacial Periods*, in which attention was drawn to the fact that any change that may have occurred in the mean temperature of the atmosphere was probably accompanied by changes in the temperature gradient between equator and poles, and therefore by modifications of the atmospheric circulation. It was suggested that this had not been sufficiently taken into account in discussing glacial and other phenomena connected with secular changes of climate. The probable effects of changes in the general circulation of the atmosphere upon the distribution of precipitation, and especially upon the position and direction of the tracks of cyclones, were examined, and Mr. Dickson suggested that the greater proportion of rainfall received with easterly winds on the polar sides of cyclones, in lower latitudes than at present, may explain some peculiar features of glacial phenomena. In any case, the writer believed that these aspects of the problem deserve more attention than they have received. They indicate that the variations of temperature required to account for climatic changes are of smaller range than has been supposed, and they may, by the exclusion of some surviving theories, assist in determining the true cause.